sponge. I have not only fed the sponge with indigo, and examined all at the moment, but the sponge so fed was put into spirit directly afterward, and *now* shows all the cells (monociliated) with the *cilium attached and the indigo still in the cells.*

This, I think, will break down Häckel's hypothesis, which is as imaginative and incorrect as it is beautiful.

His "Magosphæra," too, is figured in the "Annals" (1856), and described *in extenso* as the amœboid cell which inhabits the mucus of the cells or internodes of the Bombay great *Nitella.*

But there are no people in England, if on the Continent, who seem to be able to show this, if even they be cognizant of it.

Ex oriente lux used to be the old phrase; the light is now being *reflected* back from America. It is from there that we must expect novelties now. — H. J. CARTER, *in Annals and Mag. N. History.*

GEOLOGY.

ROCKS POLISHED BY SAND. — Dr. Kneeland, at a meeting of the Boston Society of Natural History, exhibited several specimens of glass, marble and hard stones engraved, carved and grooved by the action of sand driven by a blast of air or steam. The surface being covered with perforated paper or a stencil plate, the parts exposed by the perforations are cut rapidly and accurately, while the covered parts are untouched; protected, it is supposed, by the elasticity of the paper or metal. He drew attention to this industrial process as illustrating the advantage of diffusing, as a common branch of knowledge, information on the forces of nature, and, in this instance, on dinamical geology. This process which promises to revolutionize one of the most extensive of the industrial arts, is simply carrying out what natural forces have been doing to the surface rocks of our continent for ages. Sands carried by strong and steady winds, passing over rocks, often wear them smooth, or cover them with grooves and scratches, as noticed and figured by Mr. Blake in the granite rocks at San Bernardino Pass, California. (See Pacific Railroad Reports, Vol. V. pp. 92 and 231.) Quartz rocks were there found polished, the softer feldspar being cut away; where the latter had been protected by garnets, projections were left, tipped with the hard garnets, pointing like fingers in the direction of the wind.

On the surface of the Great Colorado desert the pebbles are finely polished by the drifting sand, or variously grooved, according to the hardness of their substance. Prof. J. Wyman also mentions that glass windows on Cape Cod have holes worn in them by the drifting sands blown by the winds.

It is the tendency, Dr. Kneeland remarked in conclusion, of modern education to pay less attention to the dead languages and to ancient history as a means of culture, and more to the practical and living issues of the day, and especially to combine a knowledge of natural phenomena with the elementary instruction of the schoolroom. In this particular instance it is altogether probable that, if the grooving of rocks by the wind-driven sands, long known by geologists and physicists and by them turned to no practical account, had been equally well known to our intelligent and skilful mechanics, the process here illustrated would have been invented years ago, and by this time have attained a high degree of perfection. The same reasoning will apply to other departments of natural and physical science, and goes to show the wisdom of those educators who are endeavoring to diffuse a knowledge of scientific principles and phenomena among the people.

Fossil Reptiles from the Rocky Mountains. — Prof. Marsh is continuing in the "American Journal of Arts and Sciences" his descriptions of the reptiles obtained during his recent expedition to the Rocky Mountains. He remarks that "the specimens from the Cretaceous formation are of great interest as they further illustrate the remarkable development in this country, both in numbers and distinct forms, of the Mosasauroid reptiles, which appear to have been comparatively rare in other parts of the world. Fortunately, moreover, some of these remains serve to clear up several obscure points in the structure of these reptiles, and prove conclusively that they had a well developed pelvic arch and posterior limbs; although up to the present time no satisfactory indication of this had been discovered, and the eminent palæontologists who have recently made these animals an especial study, consider them probably destitute of these extremities. The remains

cretaceous reptiles are *Edestosaurus dispar* and *velox* and *Clidastes Wymani* and *pumilus*. Five new species of crocodiles, and land lizards belonging to a new genus (*Glyptosaurus nodosus*, *ocellatus*, and *anceps*) were found in the Tertiary deposits.

NEW FACTS IN FOSSIL BOTANY.—The first point mentioned was the occurrence in the Devonian Shales of Kettle Point, Lake Huron, of beds containing immense quantities of spore-cases, probably of Lepidodendron. These beds are referred by the Geological Survey to the horizon of the Genesee shales of New York, and are stated to be twelve or fourteen feet in thickness, and to extend over a considerable area of country. Specimens in the collection of the Survey show that the bituminous matter which causes the combustible quality of the shale, is due entirely to the immense quantities of spore-cases present, which, under the microscope, appear as flattened discs scarcely more than one hundredth of an inch in diameter. Specimens of the trunks of *Lepidodendron Veltheimainum* and *Calamites inornatus* occur in the same beds. This is probably the oldest bed of fossil spore-cases known; but in later geological periods similar beds occur, the Tasmanite, or 'white coal' of Tasmania, which consists of spore-cases of ferns, being a notable instance. The author next referred to the discovery of specimens indicating the existence of three or four species of Tree-Ferns in the Devonian of New York and Ohio. He had received from Prof. Newberry of New York, a specimen, showing the upper part of a stem with five leaf stalks attached to it. This he had named *Caulopteris Lockwoodi*. Three other specimens collected by Prof. Newberry in Ohio indicated the existence of three distinct species belonging to two genera. The two most important had been named by Prof. Newberry *Caulopteris antiqua* and *Protopteris peregrina*. They are from the Corniferous Limestone, and thus carry down tree-ferns to the bottom of the middle Devonian. One of them has the cellular structure and vascular bundles in such preservation as to show their microscopic structure, which is precisely similar to that of modern ferns.—Principal DAWSON, in *Nature*.

THE PERSISTENCE OF PALÆOZOIC TYPES OF MADREPORARIA.—The dredging expedition which searched the sea-floor in the track of the Gulf Stream of 1868, yielded, amongst other interesting Madreporaria, a form which has been described by Count Pourtales

under the name of *Haplophyllia paradoxa*, and which was decided by him to belong to the section *Rugosa*.

The last expedition of the Porcupine under the supervision of Dr. Carpenter and Mr. J. Gwyn Jeffreys, obtained, off the Adventure Bank in the Mediterranean, many specimens of a coral which has very remarkable structures and affinities. The species is described by Prof. P. Martin Duncan, under the name of *Gwynia annulata* Dunc. The necessity of including it amongst the Rugosa and in the same family, the *Cyathoxonidæ*, as *Haplophyllia paradoxa*, is shown by him in a paper read before the Royal Society of London. Having this proof of the persistence of the rugose type from the Palæozoic seas to the present, the affinities of some so-called anomalous genera of Midtertiary and Secondary deposits are critically examined. The Australian Tertiary genus Conosmilia three of whose species have strong structural resemblances with the Rugosa is determined to be allied to the *Stauridæ* and especially to the Permian genus Polycœlia. The Secondary and Tertiary genera with hexameral, octomeral, or tetrameral and decameral septal arrangements are noticed, and the rugose characteristics of many lower Liassic and Rhetic species are examined. The impossibility of maintaining the distinctness of the Palæozoic and Neozoic coral faunas is asserted; and it is attempted to be proved that whilst some rugose types have persisted, hexameral types have originated from others, and have occasionally recurred to the original tetrameral or octomeral types; and that the species of corals with the confused and irregular septal members, so characteristic of the lowest Neozoic strata, descended from those *Rugosa* which have an indefinite arrangement of the septa. The relation between the Australian Tertiary and recent faunas, and those of the later Palæozoic and early Neozoic in Europe, is noticed, and also the long-continued biological alliances between the coral faunas of the two sides of the Atlantic Ocean.—*Nature*.

Crinoids injected by Silicates. — Dr. T. Sterry Hunt made a communication to the Natural History Society of Montreal, April 24th., on a Mineral Silicate injecting Palæozoic Crinoids.

The author described a gray granular Palæozoic limestone from New Brunswick, which had been examined by Dr. Dawson, and found to consist almost entirely of the comminuted remains of brachiopod and gasteropod shells, crustacea, and the joints and

plates of crinoids, cemented with a little calcareous spar. The crinoidal remains were, however, found to have their pores filled with a peculiar silicate, which is exposed in relief when the surface of the limestone is attacked by an acid, and then appears as a congeries of small cylindrical rods or bars, anastomozing and forming a beautiful net-work, which, under a magnifying glass, exhibits a frosted crystalline surface, and resembles the variety of arragonite known as *flos ferri*. This silicate, which also fills small interstices among the other calcareous fragments making up the limestone, is greenish in color and forms about five per cent of the rock. Though insoluble in dilute acids, it is completely decomposed by strong acids, and is found to be a hydrous silicate of ferrous oxide and alumina, with some magnesia and a little alkali, closely allied to fahlunite and to jollyte. The results of its analysis appear in "Silliman's Journal" for May.

Dr. Hunt remarked that this process of infiltration, by which the minute structure of these Palæozoic crinoids has been preserved, was precisely similar to that seen in the glauconite casts of more modern foraminifera, and in the Eozoon of older times. This ancient calcareous rhizopod, though most frequently preserved by serpentine, had been shown by himself in Canada and by Hoffman in Bohemia, to be in some cases injected by silicates related in composition to that of these crinoids. He then proceeded to speak of the great class of silicates of which serpentine, loganite, pyrosclerite, fahlunise, and jollyte are members, and which are generally described as the results of pseudomorphic changes of preëxisting silicates or carbonates, but which he, since 1853, has maintained to be original aqueous depositions, similar in their origin to the related mineral glauconite; a view now adopted by such investigators as Naumann, Scheerer, Gumbel and Credner. He noted in this connection the bearing of these facts on the *Eozoon Canadense* of Dawson, the organic nature of which, though almost universally admitted by zoologists and mineralogists, was nevertheless still questioned by Messrs. King and Rowney. These gentlemen object that the ancient rocks in which Eozoon is found are what are called metamorphic strata, which have been, according to them, subjected to pseudomorphic changes, and therefore, the Eozoon may be the result of some unexplained plastic force, which has fashioned the serpentine and other mineral silicates into forms so like those of foraminiferal organisms as to deceive the most

practical observer. This, said Dr. Hunt, was going back to the notions of those, who, rather than admit that mountains had been formed beneath the sea, imagined that the fossil shells which they often contain were not the real shells of animals, but the result of some freak of nature. The argument of Messrs. King and Rowney that the Eozoon rock is a result of pseudomorphic alteration because it contains serpentine, is a begging of the question at issue, by asking us to admit that the presence of serpentine is an evidence of metamorphic change, which is denied. He then remarked that the specimens of this organic limestone, with its injected crinoids, differed from Eozoonal rock only in containing at the same time recognizable fragments of other organic remains, and in presenting in its injected portions the differences which distinguish the minute structure of a crinoid from that of a calcareous rhizopod. In conclusion, he again adverted to the views which he had long maintained as to the origin of great masses of silicated rocks by a direct process of deposition from watery solutions, in which they were formed by chemical reactions.

Dr. Dawson spoke, confirming the observations of Dr. Hunt, which he had verified by microscopic examinations. He alluded to the structure of crinoids, which in the fossil state were generally filled with carbonate of lime so as to obliterate their pores. The infiltrating silicate in the present case however, showed, especially in decalcified specimens, that these ancient crinoids closely resembled in their minute structure, the modern forms lately studied by Dr. W. B. Carpenter and Professor Wyville Thompson, especially Comatula. Figures of these decalcified specimens were exhibited and will be published. Dr. Dawson alluded further to the process of filling up the porous calcareous skeleton of the crinoids, which was clearly shown to be prior to the cementing and consolidation of the fragmentary limestone.

MICROSCOPY.

THE SUBMERSION MICROSCOPE. — R. E. Dudgeon, M.D., describes under this name, in the Quarterly Journal of Microscopical Science for July, 1871, a contrivance by which the objective of an ordinary microscope can be plunged in water without affecting its optical qualities. A brass tube with its lower end closed watertight by a flat disc of glass is slipped over the objective from